Integrating Environmental Management Control Systems To Translate Environmental Strategy into Managerial Performance

Peter G. Roetzel
Department of Accounting and Information Systems
University of Applied Sciences Aschaffenburg
Würzburger Strasse 45
63743 Aschaffenburg, Germany

Alexander Stehle
Institute of Business Administration
University of Stuttgart
Keplerstrasse 7
70174 Stuttgart, Germany

Burkhard Pedell
Institute of Business Administration
University of Stuttgart
Keplerstrasse 7
70174 Stuttgart, Germany

Katrin Hummel
Department of Business Administration
University of Zurich
Affolternstrasse 56
8050 Zurich, Switzerland

Acknowledgements: This paper has benefited from helpful comments of Mike Shields, Wai Fong Chua, Elisabeth Connors, Stewart Jones, Martin Messner, Carolyn Westfall, and the participants of the Annual Conference of the American Accounting Association 2014 (Atlanta, GA), the 37th Annual Congress of the European Accounting Association (Tallinn, Estonia), the 76th Annual Congress of the German Academic Association for Business Research (VHB) 2014 (Leipzig, Germany) and workshop participants at the Michigan State University and the University of Sydney.

April 2019

Abstract

Purpose – This study investigates the role of environmental management control systems as mechanisms to translate environmental strategy into environmental managerial performance.

Design/methodology/approach—Based on survey data from 218 firms, the authors test a structural equation model.

Findings—The results show that environmental management control systems mediate the relationship between environmental strategy and environmental managerial performance. Moreover, the level of integration between regular and environmental management control systems significantly impacts the relationship between environmental management control systems and environmental managerial performance. Therefore, environmental management control systems are important mechanisms to translate environmental strategy into managerial performance, and a high level of integration can reinforce this role.

Research limitations/implications—The typical shortcomings of survey-based research apply to this study.

Originality/value—While previous research focuses primarily on environmental performance at the organizational level, this study addresses individual managerial performance with regard to environmental outcomes. In addition, we investigate how the level of integration between regular and environmental management control systems influences the relationship between environmental strategy and environmental managerial performance as well as the mediating role of environmental management control systems.

Keywords: managerial behavior, environmental accounting, management control system, survey data, structural equation modeling

JEL Classifications: M41

Because the "environmental advantage looms larger as a decisive element of business strategy, […] no company can afford to ignore green issues" (Esty and Winston, 2009, p. 4).

1. Introduction

Contingency theory posits a fit between organizational structural design and contingencies. Since the designs of an organizational structure and a management control system (MCS) are "inseparable and interdependent" (Hopwood, 1974; Otley, 2016, p. 46), contingency theory suggests that a firm's MCS must fit with the contextual variables to achieve operational and financial performance. Among the contextual variables, strategy plays a distinct role as it is not exogenously given, and managers do have "strategic choice" (Chenhall, 2003, p. 150). Consequently, management accounting research has long studied the role of MCSs in translating a firm's strategy into performance (Dent, 1990; Langfield-Smith, 1997; Simons, 1990). Thus, MCSs must be tailored to translate strategy into action to achieve competitive advantages and superior performance (Dent, 1990; Langfield-Smith, 2006). With the increasing awareness of environmental responsibility (Esty and Winston, 2009), firms aim to improve not only their financial but also their environmental performance. Therefore, environmental MCSs should be implemented to manage a firm's environmental performance; however, contingency-based research on the relationships of environmental strategy, environmental MCSs and environmental performance is currently scarce. According to Henri and Journeault (2010) and Simons (1987; 1990) environmental MCSs can be defined as the "formalized procedures and systems that use financial and ecological information to maintain or alter patterns in environmental activity" (Henri and Journeault, 2010, p. 64). These procedures and systems include, for example,

planning controls, cybernetic controls, and cultural controls, which we refer to as management control practices.

Research on environmental MCSs is currently at a nascent yet rapidly developing stage (Guenther et al., 2016). Empirical evidence indicates that firms with a proactive environmental strategy are more likely to implement and use elements of an environmental MCS (Perego and Hartmann, 2009; Pondeville et al., 2013; Riccaboni and Leone, 2010; Rodrigue et al., 2013), which in turn fosters the firms' environmental performance (e.g., Epstein and Wisner, 2005; Henri and Journeault, 2010; Henri et al., 2017; Judge and Douglas, 1998; Russo and Harrison, 2005). Most previous research focuses on *firms'* environmental performance, although a long tradition of research on MCSs has revealed that the behavioral implications at the managerial level are important for the "success" of MCSs (Simons, 1990). After all, MCSs are implemented to align the interests of the firm and the manager and thus "to direct employee behavior" (Malmi and Brown, 2008, p. 290). Following Mahoney et al. (1965), we define environmental managerial performance as all managerial actions regarding planning, investigating, coordinating, evaluating, supervising, staffing, negotiating, and representing with regard to environmental strategy implementation.

Currently, however, there are only two studies that explicitly investigate the role of environmental MCSs in the context of environmental *managerial* performance. Norris and O'Dwyer (2004) reveal conflicting signals from different elements of the environmental MCS and a particularly strong influence of informal controls on fostering socially responsive decision making among managers. Sundin and Brown (2017) find that the integration of environmental issues into the MCS positively influences the extent to which managers consider environmental outcomes in their decision making. Both studies utilize a case-study approach, thereby providing

in-depth evidence for a single company. Nonetheless, large-sample cross-sectional evidence is still missing. Against the background of this underdeveloped stage of research, our first research question addresses the relationships between environmental strategy, environmental MCSs, and environmental managerial performance.

Another concern within management control research is the integration of environmental and regular MCSs. In that respect, the concept of integrated thinking is gaining increasing attention among both researchers and practitioners.[1] Based on a review of the literature, Oliver et al. (2016) state that "a direct link between integrated thinking and sustainability is evident in the emerging literature" (Oliver et al. 2016, p. 230) and introduce a distinction between a "soft" and a "hard" approach to integrated thinking. Both approaches include typical elements of an environmental MCS, such as a values and beliefs (soft approach) and sustainability-related key performance indicators (KPIs) (hard approach). The authors emphasize that the link between these two approaches is particularly important for fostering integrated thinking. In particular, the shift towards "hard" integrated thinking would fundamentally impact organizational development, thereby requiring a need for a change in management accounting tools and decision-making processes (Dumay et al., 2018; Oliver et al., 2016). Consequently, management accountants and MCSs can play a vital role in promoting integrated thinking (Gatti et al., 2018) as well as the implementation of environmental strategy in managerial decision making and action. These aspects are also reflected in the current literature on MCSs, which discusses the integration of environmental and regular MCSs, among other things, particularly the question of whether environmental MCSs are part of special environmental (e.g., Henri and Journeault,

[1] Integrated thinking also plays a central role in the context of integrated reporting, as promoted by the International Integrated Reporting Council (IIRC). Integrated thinking is closely linked to integrated reporting as promoted by the IIRC. Integrated thinking basically relates to "the active consideration by an organization of the relationships between […] and the capitals that the organization uses or affects. Integrated thinking leads to integrated decision-making and actions that consider the creation of value over the short, medium and long term." (International Integrated Reporting Council (IIRC), 2013, p. 4)

2010; Schaltegger and Burritt, 2000) or general corporate management systems (e.g., Gond et al., 2012; Sundin and Brown, 2017). Studies in the former line of research particularly focus on controlling environmental strategies (e.g., Henri and Journeault, 2010), whereas studies in the latter line of research address the joint interaction of environmental and regular MCSs in steering environmental strategy in the broader context of other business objectives (e.g., Gond et al., 2012). Because separate environmental management systems are primarily rooted in external standards for these types of systems, e.g., ISO 14001 (González-Benito et al., 2011), separate environmental MCSs might "remain peripheral or in parallel" (Gond et al., 2012, p. 220). This stream of literature raises doubts about whether regular MCSs can sufficiently affect environmental managerial performance. Moreover, if not, how could separate environmental MCSs be designed to achieve environmental goals?

In contrast, previous research questions whether such peripheral systems can influence managerial behavior as much as general corporate management systems (Gond et al., 2012). Thus, this study builds a bridge between these two streams of literature by posing the question of how the integration affects the MCS's effectiveness as a mechanism that translates environmental strategy into environmental managerial performance. We are interested in whether the level of integration of environmental and regular MCSs impacts the relationship between the strategy and MCS, the relationship between the MCS and performance, or both.

This study contributes to the literature in various ways. First, we expand existing knowledge on the role of environmental MCSs in supporting the alignment between firms' environmental strategy and environmental managerial performance, thereby extending the contingency-based literature on MCSs in an environmental context. In contrast to previous studies that investigate environmental outcomes at the firm level (e.g., Epstein and Wisner, 2005;

Gadenne et al., 2012; Henri and Journeault, 2010; Judge and Douglas, 1998; Russo and Harrison, 2005), we explicitly focus on environmental performance at an individual managerial level, for which only scarce empirical evidence is currently available. We show that an environmental MCS acts as a significant translating mechanism for environmental strategy. Second, our analysis of the role of the integration between environmental MCSs and regular MCSs responds to the need to further investigate the integration between environmental MCSs and regular MCSs as a mechanism to better align managerial behavior with environmental strategy. Thus, we show that companies that integrate their environmental MCSs obtain stronger translating mechanisms, which results from the increased behavioral impacts of such integrated environmental MCSs. In that respect, this study also provides insights into an emerging topic, namely, integrated thinking as proposed by the IIRC, and how such an integrated thinking might be promoted within the organization by an integrated MCS. Third, our large-sample empirical evidence based on survey data helps to further generalize the results from earlier case-based research. By constructing our measurements of environmental strategy, environmental MCSs and environmental managerial performance based on previous research and employing factor analysis, we respond to the call of Guenther et al. (2016, p. 167) to "make the empirical findings more comparable and generalizable".

The remainder of this paper is organized as follows: In the next section, we provide the theoretical basis for our study and develop our research hypotheses. The subsequent section presents the methodology, including the sample description, the data collection process, the constructs' measurements and the SEM. The fourth section presents the results as well as insights from additional analyses. In the final section of this paper, we discuss our results and draw conclusions.

2. Theory and Hypotheses

To develop our theoretical model, this study employs a contingency-based approach. Contingency theory was originally developed in the context of organizational design (Burns and Stalker, 1961; Galbraith, 1973; Lawrence and Lorsch, 1967; Perrow, 1967; Thompson, 1967) and posits a fit between organizational structural design and contingencies. Since the designs of an organizational structure and an MCS are "inseparable and interdependent" (Hopwood, 1974; Otley, 2016, p. 46), contingency theory has been increasingly used and applied in MCS research over the years. Much research shows that the effectiveness of MCSs depends on the context within which they operate (for a recent review, see Otley, 2016). Among the contextual variables typically examined, strategy plays a distinct role as it is not exogenously given (Chenhall, 2003). Managers have a "strategic choice" in responding to the contextual environment, and the MCS needs to fit with this strategic choice (for an overview of the literature, see Langfield-Smith, 1997). Examining the role of strategy and its relationship to the design of the MCS is thus of particular interest as both strategy and the design of the MCS can be influenced by management. Only recently have researchers begun to transfer this approach into an environmental context (Perego and Hartmann, 2009; Pondeville et al., 2013).

To model the implementation of environmental strategies and their corresponding behavioral impacts as well as the effectiveness of environmental MCSs in influencing managerial behavior, we refer to Durden's (2008) social responsibility framework. This framework links social responsibility goals with socially responsible outcomes via an adequate MCS in a cause-and-effect model. According to the author, social responsibility goals need to be incorporated in formal and informal management control practices. Consequently, these socially

responsible control practices direct management actions and decision making towards the social responsibility goals of the organization. Finally, these socially responsible actions "lead to desired social responsibility outcomes" (Durden, 2008, p. 688) of the organization.

Durden (2008) suggests causal, unidirectional relationships between a company's goals and its MCS, the managerial actions and the outcomes. We argue that this model neglects some important relationships. First, Durden does not consider a direct relationship between a company's goals and the managerial actions. In his model, all effects are transformed by the MCS. We suggest that there might be a direct relationship because a MCS cannot transform every dimension of a goal into managerial action. We suppose that even abstract goals might signal to managers the organization's desired behavior and thus shape managerial action. We suggest that instead of a causal chain, a mediation model with MCS as mediator might illustrate the relationships between goals, MCS and managerial action better. The approach of MCS as a mediator reflects our comprehension of MCSs as translating mechanisms.

Thus, we adopt Durden's framework with some modifications. First, we consider environmental strategies instead of a company's goals because the latter are highly dependent on an individual company's type of products and processes, as a company's products and processes determine a company's environmental impact. Second, the social responsibility framework differentiates only between formal and informal management control practices, although more differentiated sets of management control practices have been successfully applied in an environmental context (e.g., Epstein and Wisner, 2005; Henri and Journeault, 2010; Lee, 2012). We therefore apply an entire set of management control practices (i.e., an MCS), which are based on different control mechanisms. Third, instead of using the two distinct elements of "management actions" at the individual level and "social responsibility outcomes" at the

organizational level, we focus on the level of the individual manager. We are interested not only in the function of environmental MCSs as mediators (i.e., translating mechanisms) between environmental strategy and performance but also in the moderating impact of the level of integration between environmental and regular MCSs on this function. Figure 1 provides an overview of our theoretical model, which is further delineated below.

Insert Figure 1 here

Our first hypothesis argues for a positive relationship between a firm's environmental strategy and its environmental managerial performance. Banerjee et al. (2003, p. 106) define environmental strategy as "the extent to which environmental issues are integrated with a firm's strategic plans". An environmental strategy can be described as a continuum ranging from merely complying with regulations to voluntarily aiming to reduce the firm's negative environmental impact (Sharma, 2000). Thus, various factors, such as public pressure, regulatory forces and the establishment of competitive advantages, directly and indirectly cause firms to integrate environmental issues into their corporate strategy (Banerjee et al., 2003). Since a strategy aims at achieving predefined objectives and goals, we argue that the integration of environmental aspects into a firm's strategy is positively related to environmental managerial performance. An environmental strategy articulates the environmental objectives to the managers, and as a consequence, managers adjust their behavior accordingly. The strategy literature typically distinguishes between strategy formulation and strategy implementation

(Snow and Hambrick, 1980). Although the literature shows that the appropriate design of an MCS is critical in aligning the manager's behavior with the firm's strategy, we nevertheless also argue for a direct relationship between environmental strategy and employee behavior. In a study of seven Canadian and US oil and gas companies, Sharma (1997) finds that more proactive environmental strategies have a positive effect on the emergence of organizational capabilities that open up potential competitive advantages. Similarly, Klassen's (2001) study of plant managers in US manufacturing firms in the furniture industry shows that plant managers' stronger emphases on ethical values (relative to economic and legal values) are positively related to environmental performance. Wisner et al. (2009) report a positive relationship between environmental proactivity and environmental performance for a sample of 179 firms. Liu et al. (2015) compare Western and Chinese firms in a meta-analysis and find a stronger effect of a more proactive environmental strategy on environmental performance in Western firms compared with Chinese firms. Taken together, the above literature leads us to formally posit the following hypothesis:

H1: If environmental MCSs are used separately, a positive relationship adheres between a firm's environmental strategy and environmental managerial performance.

Next, we argue that this relationship is mediated through the use of an environmental MCS. Specifically, we expect to find a positive relationship between a firm's environmental strategy and the environmental MCS. MCSs are traditionally designed to translate a business strategy into superior performance (Langfield-Smith, 1997). This role of MCSs is also pertinent in the context of environmental strategy as follows: "By revealing cause-and-effect relationships among

environmental operations, strategy and goals, or between environmental and organizational issues, […] eco-control is used as a facilitator during the decision-making process and contributes to environmental performance" (Henri and Journeault, 2010, p. 68).

Nevertheless, only a few studies analyze the impact of environmental strategy on the design and use of environmental MCSs (Perego and Hartmann, 2009; Pondeville et al., 2013; Riccaboni and Leone, 2010). In a survey of Belgian manufacturing companies, Pondeville et al. (2013) find that the environmental strategy has a positive and significant influence on the development of an appropriate environmental MCS. The authors consider formal and informal environmental management control practices within their MCSs. Riccaboni and Leone (2010) study the change process of MCSs due to the formulation of a sustainability strategy. In their qualitative case study of Procter & Gamble, they find support for the adaptation of formal and informal management control practices to fit this new strategic initiative. Perego and Hartmann (2009) conduct a survey among Dutch financial managers to analyze the alignment of performance measurement systems as one type of management control practice with an environmental strategy. The authors find that an environmental strategy positively influences the use of environmental performance measures, thereby supporting the hypothesis that an environmental strategy positively influences the design and use of environmental MCSs. We therefore posit the following hypothesis:

H2: A positive relationship adheres between a firm's environmental strategy and its use of an environmental MCS.

Since we argue that the environmental MCS serves as a mediator to translate a firm's environmental strategy into environmental managerial performance, we also elaborate upon the relationship between environmental MCSs and environmental managerial performance. As previously outlined, environmental MCSs facilitate internal decision making, thereby contributing to environmental performance (Henri and Journeault, 2010). Several studies analyze the relationship between environmental MCSs and environmental performance at the firm level (e.g., Epstein and Wisner, 2005; Gadenne et al., 2012; Henri and Journeault, 2010; Judge and Douglas, 1998; Russo and Harrison, 2005). Judge and Douglas (1998) investigate the consideration of environmental aspects in the strategic planning process as one type of management control practice in a cross-sectional survey of US firms, and they find a positive relationship between the degree of consideration in strategic planning and environmental performance. Similarly, for a sample of 314 Australian firms, Gadenne et al. (2012) report a positive relationship between the use of environmental management practices and a firm's environmental performance. At the employee level, they find a positive relationship between a firm's social responsibility practices and employee value performance. In contrast, in a study of US electronics plants, Russo and Harrison (2005) do not confirm a significant relationship between the degree of inclusion of environmental managers in strategic processes and environmental performance. Epstein and Wisner (2005) analyze the impact of multiple control practices on environmental compliance using data on manufacturing facilities in Mexico. They identify a positive impact of some control practices (e.g., planning, rewards) on environmental performance but not of others (e.g., reporting structure). Based on survey data from Canadian manufacturing companies, Henri and Journeault (2010) analyze the influence of eco-controls on environmental performance and find a significant relationship between the two variables.

Similarly, Henri et al. (2017) provide longitudinal evidence on the impact of changes in eco-controls and environmental performance. They conclude that the delivery of a credible signal, not the magnitude of changes, is associated with increased environmental performance.

However, in the context of environmental MCSs, few studies explicitly analyze behavioral implications (e.g., Norris and O'Dwyer, 2004; Sundin and Brown, 2017). Norris and O'Dwyer (2004) analyze the decision-making impact of formal and informal management control practices in a qualitative case study. They find behavioral confusion among managers because conflicting or even opposing signals arise from formal and informal management control practices. As a result, the managers choose which signals to follow (Norris and O'Dwyer, 2004). This finding indicates that poorly developed environmental MCSs, especially in the case of multiple objectives, might negatively affect performance. Similarly, the findings of Rae et al. (2015) from a survey of senior managers indicate that behavioral aspects are related to environmental performance. In addition, Sundin and Brown (2017) conduct qualitative research that addresses the behavioral bonding mechanisms of multiple management control practices in the simultaneous pursuit of environmental and other business objectives. The authors find that the design and use of environmental MCSs, at least to some extent, influence employees to behave according to defined environmental objectives and hence enable high environmental performance. We therefore formally state the following hypothesis:

H3: A positive relationship adheres between a firm's use of an environmental MCS and environmental managerial performance.

Finally, we are interested in whether integration between an environmental MCS and a regular MCS impacts the mediating role of the environmental MCS. Classifying environmental MCSs as part of special environmental management systems is a feasible approach because environmental management systems are designed to implement environmental objectives. Thus, they can be interpreted as a special form of MCS since they share a common purpose (Buhr and Gray, 2012) but remain separate from regular MCSs. Environmental management systems are largely based on external standards, such as the Eco-Management and Audit Scheme (EMAS) or ISO 14001 (González-Benito et al., 2011), and thus focus solely on controlling environmental objectives. However, environmental managerial action takes place in a wider business context in which managerial performance is determined by and evaluated against not only environmental objectives but also other business objectives (e.g., Sundin and Brown, 2017). Therefore, environmental objectives will remain a low priority among managers unless they are aligned with other corporate goals; thus, environmental MCSs need to be integrated with regular corporate management systems. These systems might be stronger mechanisms for guiding managerial behavior than separate environmental MCSs (e.g., Gond et al., 2012). To encourage managers to pursue environmental objectives, companies must ensure that managerial behavior is influenced by both environmental and regular MCSs. Based on a case study in the hotel sector in Sri Lanka, Gunarathne and Lee (2015, p. 376) emphasize the importance of "making the EMA [environmental management accounting] a part of the day-to-day management process" to achieve continuous improvement in environmental performance at the organizational level. Following this approach, integrating both types of MCS enhances the implementation of an environmental strategy (Buhr and Gray, 2012) and subsequently allows managers to improve their performance with respect to environmental issues. Therefore, the level of integration might

influence the effectiveness of the translating mechanism. Regarding the level of integration of environmental and regular MCSs, we refer to the notion of Gond et al. (2012, p. 206), who define it as *"the degree of overlap between the two types of control systems"*.

Based on the preceding discussion, we expect that the integration of environmental MCSs with regular MCSs will reinforce the effect of MCSs as translating mechanisms for environmental strategy. Thus, we assume that the integration of environmental MCSs and regular MCSs positively influences the mediation effect of environmental MCSs on the relationship between environmental strategy and environmental managerial performance. Therefore, we propose the following hypotheses:

H4a: The level of integration of environmental and regular MCSs moderates the relationship between environmental strategy and environmental MCSs.

H4b: The level of integration of environmental and regular MCSs moderates the relationship between environmental MCSs and environmental managerial performance.

H4c: The level of integration of environmental and regular MCSs moderates the relationship between environmental strategy and environmental managerial performance.

3. Research Design

3.1. Sample and Data Collection

The initial sample of the online survey consisted of 2,500 top managers of German companies. The selected companies were identified using the Hoppenstedt database. The initial targeted managers were mostly CEOs, CFOs, heads of accounting and finance departments, and heads of environmental management departments.

After we identified the relevant managers, survey data were collected. All participants were contacted, and each received a link to an online questionnaire through e-mail. Participation was voluntary, and no payment for participation was offered. After we sent two reminder e-mails to those who had not yet responded, the final number of usable returned questionnaires was 218 (response rate of 10.44%). Table I provides an overview of the sample firms by functional area, ownership structure and industry (according to the North American Industry Classification System, NAICS). Most respondents are top managers in the area of accounting and finance (48.2%), followed by executive board members (28.4%). Reflecting the typical ownership structure of German companies, most of the respondents' companies are family-owned businesses (37.4%), followed by holding companies (28.4%). The reported number of employees in the respondents' companies range from 10 to 64,199, with an average of approximately 12,871 employees. The reported annual sales of the respondents' companies range from 1 million euros to 178,981 million euros, with an average of 1,724.23 million euros.

Insert Table I here

Because of the greater familiarity of the managers in our study with the German language, we translated the items into German. To address missing values, we used expectation maximization. Following the recommendation of Van der Stede et al. (2005), we tested for nonresponse bias. A comparison of the mean scores between the early and late responses showed no statistically significant differences.

With regard to ex ante method errors, the most frequently discussed source of error is common method bias (CMB) (Podsakoff et al., 2012). The present study applied the procedures recommended in the literature to avoid CMB. Further measures included ensuring the participants' anonymity and using neutral wording in the survey to minimize socially expected behavior. To largely avoid acquiescence bias (participants always agreeing with the survey items), no extreme poles were used (Spector, 2006). In addition, the results of Harman's single-factor test (first factor explains 17.95% of variance) did not indicate significant CMB.

Concerning demographic and personal characteristics, we used background factors such as functional area. These variables may confound results (Spector, 2006); however, a comparison of the mean values of the answers between different groups of demographic and personal characteristics showed no statistically significant differences.

3.2. Variable Measurement

3.2.1. General procedure

The survey was designed to collect information on environmental strategy, the design and use of environmental MCSs, environmental managerial performance, and the integration of environmental and regular MCSs. We used the validated measures of constructs from Banerjee et al. (2003), Judge and Douglas (1998), Henri and Journeault (2010), and Sharma (2000) to obtain items that have been empirically tested in environmental settings and have been found to be significant through confirmatory factor analysis (CFA).

Our measurement of EMCS follows Malmi and Brown's (2008) categorization of five different management control practices as follows: planning controls (PLAN), cybernetic

controls (CYB), reward and compensation controls (REW), administrative controls (ADM), and cultural controls (CULT).

Drawing on previous empirical results, we selected the items in the following ways: (a) We checked whether the complete constructs were significantly valid and reliable. (b) If the constructs consisted of more than three items [1], we selected the three items of the constructs with the highest factor loadings. (c) Last, to ensure that the items loaded on the same factor, we checked shortened constructs with an exploratory factor analysis, namely, a principal axis factoring (PAF) analysis [2]. Consistent with Grabner (2014), we removed items with a factor loading below 0.4. The items were measured on seven-point Likert scales, ranging from 1 = "strongly disagree" to 7 = "strongly agree", except for environmental managerial performance (EMP) and integration between environmental and regular MCSs (INT), which were measured on a scale ranging from 1 = "very low" to 7 = "very high". The final items of the four constructs along with the factor loadings and Cronbach's alphas are presented in the appendix (Tables AI-AIV).

For all measurement constructs, Cronbach's alpha was above 0.9, thereby indicating high internal consistency. Similarly, factor loadings were also rather high, ranging from 0.8 to 0.9 for environmental strategy (ESTRAT), EMP and INT. With respect to EMCS, the factor loadings for CYB, REW, ADM and CULT were also rather high, ranging from 0.6 to 0.9. Only for PLAN were factor loadings between 0.40 and 0.48; however, they were greater than any of their cross loadings, as required by Hair et al. (2009).

Table II provides an overview of empirical studies that examine the respective management control practices in an environmental context.

Insert Table II here

3.2.2. Environmental managerial performance

We used the managerial performance measure of Mahoney et al. (1965) and adapted it to an environmental context. This measure has been extensively used in empirical accounting research to measure managerial performance (Chalos and Poon, 2000; Dunk, 1993; Hall, 2008). Previous research finds that self-reported performance measures generate less bias than do supervisors' ratings (Marginson and Ogden, 2005; Parker and Kyj, 2006) and correlate with superiors' subjective ratings and objective measures of subordinates' performance (Furnham and Stringfield, 1994; Venkatraman and Ramanujam, 1987). Moreover, Wentzel (2002) provides evidence that this measure is useful in measuring the effect of goal commitment on managerial performance.

3.2.3. Integration of environmental MCSs and regular MCSs

For the measurement of the level of integration of environmental and regular MCSs, we introduced a new measurement because no adequate scale is available to address this topic. We asked the respondents to indicate the level of integration of environmental MCSs and regular MCSs.

3.3. Methodological Approach

Our hypotheses on the relationships between environmental strategy, environmental MCSs and environmental managerial performance were investigated through SEM. According to Gerdin and Greve (2004), path analysis is particularly useful for studying Cartesian fit models in a contingency mediation analysis. Specifically, we relied on IBM SPSS AMOS 23 software for our statistical analyses. The SEM technique consisted of two steps. First, the measurement model of the variables was evaluated based on confirmatory factor analyses. CFA was conducted to test the validity of the constructs and to determine the model fit (Church and Burke, 1994; Malhotra et al., 2012). Moreover, CFA was used to test the unidimensionality of each of the four multi-item constructs: ESTRAT, EMCS, EMP, and INT. Second, the structural model was analyzed based on maximum likelihood estimation (Zhao et al., 2010). We used maximum likelihood least-squares estimation, which, after robust distance-weighted least-squares estimation, is the most appropriate approach when performing CFAs among ordinal variables with modest-to-small sample sizes (Flora and Curran, 2004). Finally, we analyzed the influence of the integration of environmental MCSs with regular MCSs by conducting a moderated mediator analysis following the procedure of Hayes (2013) and Hayes (2015).

4. Results

4.1. Descriptive Statistics

Panel A of Table III presents our summary statistics. The three items measuring environmental strategy have average values between 3.9 and 4.2 (with a standard deviation of approximately 2), thereby indicating that environmental aspects are moderately integrated into the corporate strategy on average. In terms of environmental management control practices, cultural controls

are most strongly aligned with environmental aspects. On the other hand, the descriptive statistics reveal that reward and compensation is the least aligned with environmental aspects. With respect to environmental managerial performance, the average values of the items are more homogeneous, ranging from 3.04 to 3.38. Thus, managers are rather conservative in self-assessments of their environmental performance. With regard to the integration between environmental and regular MCSs, the integration is strongest for cultural controls (mean value of 4.4 and standard deviation of 1.7) and weakest for reward and compensation controls (mean value of 2.9 and standard deviation of 1.6). For all of the items, the answers from all of the respondents cover both the minimum and the maximum of the theoretical range.

Insert Table III here

Panel B of Table III presents the Pearson correlation coefficients, revealing positive and significant correlations between the constructs. In addition, these univariate results tend to support our hypotheses, revealing positive and significant correlations between ESTRAT and the EMCS's elements, between ESTRAT and EMP as well as between the EMCS's elements and EMP. We investigate potential bias due to firm size, ownership structure, functional area of respondents, and industry. We analyze potential correlations between these firm specifics and our constructs based on Pearson correlation statistics. We find positive correlations between company size and environmental strategy ($r = 0.191$, $p < 0.05$ (number of employees); $r = 0.151$, $p < 0.5$ (sales)), similar to the results of Sharma (2000), and between company size and

environmental MCSs ($r = 0.214$, $p < 0.01$ (number of employees); $r = 0.163$, $p < 0.5$ (sales)), also observed by Perego and Hartmann (2009). Furthermore, we observe a weak positive correlation between company size and the level of integration ($r = 0.168$, $p < 0.05$ (number of employees)). With respect to the other constructs, we find no significant associations among these control variables.

4.2. Hypothesis Testing

Before testing our hypotheses using the SEM, we checked for validity and reliability criteria. Unidimensionality is a necessary condition for reliability analysis and construct validation. Following the procedure of Jaccard and Wan (1996), our results demonstrate our constructs' unidimensionality by specifying a measurement model for each construct and examining how well the constituent items represent the same construct. The results from CFA reveal a very high fit ($\chi 2/df = 1.148$, $p = 0.10$, comparative fit index (CFI) = 0.988 > 0.90, root mean square error of approximation (RMSEA) = 0.079 < 0.08). A CFI of 0.95 or above suggests that each of the constructs is unidimensional (Jöreskog and Sörbom, 1986), and a RMSEA below 0.10 is generally regarded as an indication of good fit (Libby and Tan, 1994).

To test convergent and discriminant validity, we draw on the criteria of Hair et al. (2009) and Trinkle and Lam (2014). Average variance extracted (AVE) and composite reliability (CR) are used to test convergent validity. As Table IV shows, the AVE for each construct is greater than the 0.5 rule of thumb of Hair et al. (2009). Thus, all constructs are valid in this regard. Convergent validity is fulfilled when CR > AVE; thus, all constructs achieve convergent validity. Discriminant validity is demonstrated when AVE exceeds both maximum shared squared variance (MSV) and average shared squared variance (ASV). Table IV shows that this

criterion is fulfilled for all constructs. Furthermore, the AVE for a factor being greater than the squared correlations between this factor and other factors in the overall measurement model is a strong indicator of discriminant validity (Chapman and Kihn, 2009). Therefore, the constructs have adequate discriminant validity.

Insert Table IV here

4.2.1. Mediation analyses (without moderation)

Our first three hypotheses form a mediation model, which suggests that an environmental MCS mediates the effect of environmental strategy on environmental managerial performance. Thus, H1 addresses the direct effect, while H2 and H3 address the paths from the independent variable to the mediator and from the mediator to the dependent variable, i.e., the indirect effect. We use a mediation analysis, drawing on the procedure of Hayes (2013) and Zhao et al. (2010) and using a bootstrap analysis with 5,000 samples. Figure 2 displays the results from the mediation analysis.

H1 suggests a direct positive relationship between a firm's environmental strategy and environmental managerial performance if environmental MCSs are used separately. Figure 2 (mediation model without integration) shows that the direct path from ESTRAT to EMP ($c = 0.016$, $p > 0.10$) is not significant. Thus, H1 is not supported. This result is in contrast to findings provided by Wisner et al. (2009) and Liu et al. (2015). However, these studies focus on the firms' environmental performance and not the behavioral implications on the managerial level.

H2 suggests that there is a positive relationship between a firm's environmental strategy and its use of an environmental MCS. The mediation analysis shows that there is a positive and significant relationship between a firm's environmental strategy and its use of an environmental MCS ($a = 0.920$, $p < 0.01$) (Figure 2). Thus, H2 is supported. Firms with a more proactive environmental strategy include environmental aspects to a greater extent in their MCS. This finding is in line with previous findings obtained by Pondeville et al. (2013), Riccaboni and Leone (2010), and Perego and Hartmann (2009).

H3 suggests that there is a positive relationship between a firm's use of an environmental MCS and environmental managerial performance. The mediation analysis reveals that there is a positive and significant impact of a firm's use of an environmental MCS on environmental managerial performance ($b = 0.733$, $p < 0.01$) (Figure 2). Thus, H3 is supported, thereby indicating that the consideration of environmental aspects in a firm's MCS is positively related to environmental managerial performance. This finding is consistent with previous studies' findings obtained for firm-level environmental performance (Epstein and Wisner, 2005; Gadenne et al., 2012; Henri and Journeault, 2010).

Regarding the mediation analysis, we find that the mean indirect effect is positive and significant ($a \times b = 0.595$, $p < 0.01$) with a 95% confidence interval (CI) excluding zero (95% CI = 0.426 to 0.770). The total effect ($a \times b + c = 0.632$, $p < 0.01$) is positive and significant with a 95% CI excluding zero (95% CI = 0.527 to 0.737). Regarding Zhao et al.'s (2010) mediation types, a mediation with a significant indirect effect and an insignificant direct effect is an "indirect-only mediation". Thus, our results reveal an indirect-only mediation, i.e., a firm's use of an environmental MCS as a mediator for the impact of environmental strategy on environmental managerial performance is robust, and the omission of other mediators with

similar impacts is unlikely because a significant direct effect would point to the possible existence of some other omitted mediator. The environmental MCS apparently acts as a mechanism for translating the firm's environmental strategy into environmental managerial performance. These findings are consistent with previous studies' findings on regular MCSs (for an overview, see Langfield-Smith, 1997), thereby transferring these findings into an environmental context. Specifically, the findings show the importance of an environmental MCS for the translation of an environmental strategy into environmental managerial performance. Moreover, the results add a new dimension to the environmental MCS literature by particularly focusing on managerial (instead of organizational) environmental performance.

Insert Figure 2 here

4.2.2. Moderated mediation analyses

We extended the mediation analysis by integrating a moderator variable, namely, the integration of environmental and regular MCSs (INT). We used the procedure of Hayes (2015) to calculate and test the moderated mediation model. A moderated mediation occurs *"when the strength of an indirect effect depends on the level of some variable, or in other words, when mediation relations are contingent on the level of a moderator"* (Preacher et al., 2007, p. 193). We suggest in H4a, H4b, and H4c that the strength of an environmental MCS's translation mechanism of environmental strategy into environmental managerial performance depends on its integration

with a regular MCS because a separate environmental MCS might *"remain peripheral or in parallel"* (Gond et al., 2012, p. 220) if it is not integrated with a regular MCS.

We calculated a moderated mediation model using a bootstrap analysis with 5,000 samples. All standard errors are heteroscedasticity-consistent. H4a and H4b suggest that the level of integration of environmental and regular MCSs moderates the mediation effect of environmental MCSs, i.e., the indirect effect in the mediation model. H4a focuses on the effect of environmental strategy on environmental MCSs, and H4b focuses on the effect of environmental MCSs on environmental managerial performance. In addition, H4c suggests that the original effect of an environmental strategy on environmental managerial performance is moderated by the integration of environmental and regular MCSs.

As shown in Table V, the test of moderation of the effect of environmental strategy on environmental MCSs yields a nonsignificant result ($\beta = 0.099$, 95% CI = -0.123 to 0.321, $p = 0.381$). Thus, H4a is not supported. Regarding H4b, which suggests a moderation of the relationship between environmental MCSs and environmental managerial performance, the results show that the moderation is positive and significant with a 95% CI excluding zero ($\beta = 0.661$, 95% CI = 0.145 to 1.177, $p = 0.012$). Regarding H4c, which predicts a moderation of the relationship between environmental strategy and environmental managerial performance, we find a negative and significant moderation with a 95% CI excluding zero ($\beta = -0.686$, 95% CI = -1.199 to -0.173, $p < 0.01$).

Furthermore, we find a positive and significant effect of environmental strategy on environmental managerial performance ($c = 0.408$, $p < 0.01$) with a 95% CI excluding zero, if environmental MCSs are integrated (95% CI = 0.220 to 0.596).

To test the total moderation effect, we used Hayes' (2015) index of moderated mediation, which quantifies the association between the indirect effect and the moderator. The index of moderated mediation is significant (index = 0.460, S.E. = 0.195) with a 95% CI excluding zero (95% CI = 0.113 to 0.889).

We find that the indirect effect via environmental MCSs is moderated, i.e., that the conditional indirect effects estimated at different values of the level of integration of environmental and regular MCSs are significantly different from each other. Thus, we find that the integration of environmental and regular MCSs matters for the role of the mediator, i.e., for the role of the environmental MCS. In cases with no or low integration of environmental and regular MCSs, we find that the mediation effect is lower (a x b = 0.171, 95% CI = 0.063 to 0.340) than that in cases with a high or full integration (a x b = 0.631, 95% CI = 0.313 to 1.041). Following Hayes (2015) and Preacher et al. (2007), we further investigated the impact of the moderator on the original XY relationship between environmental strategy and environmental managerial performance. The results are displayed in Figure 3.

Insert Table V here

Taken together, our results suggest that the integration of environmental MCSs and regular MCSs does not impact the relationship between environmental strategy and environmental MCSs but significantly impacts the relationship between environmental MCSs and environmental managerial performance. Thus, integrating both types of MCSs partly reinforces

the translation mechanism of environmental MCSs. Hence, the moderated mediation becomes a complementary mediation regarding the typization of Zhao et al. (2010).

5. Discussion and Conclusion

Several questions were posed in the beginning of this paper that are important to reconsider. The first question asked was whether MCSs are translating mechanisms. Using the MCS literature and contingency theory, we argued that the relationship between environmental strategy and environmental managerial performance (at the individual level) is mediated by a firm's environmental MCS, which, in turn, is a mechanism for translating environmental strategy into managerial performance. Previous research argues that MCSs are implemented to align the interests of the firm and the manager and thus to steer the manager's behavior (Malmi and Brown, 2008). However, most previous studies focus on firms' environmental performance and neglect the behavioral implications at the individual managerial level. By focusing on environmental managerial performance, we extend the previous literature's findings. The results of our survey of large companies show that environmental MCSs mediate the relationship between environmental strategy and environmental managerial performance and that this impact is more effective when the environmental MCS is integrated into the regular MCS. This finding supports the contingency-based approach to MCS, thereby adding to the so-far limited empirical evidence on contingency-based research in the context of *environmental* MCSs.

The second question asked whether separate or integrated environmental MCSs are more beneficial when aligning managerial behavior to a firm's environmental strategy. We bridged two lines of research. Specifically, these two lines of research diverge with respect to whether environmental MCSs are part of special environmental management systems (e.g., Henri and

Journeault, 2010; Schaltegger and Burritt, 2000) or regular corporate management systems (e.g., Gond et al., 2012; Sundin and Brown, 2017). We find that environmental MCSs integrated into regular MCSs translate environmental strategy into environmental managerial performance more effectively, but the “usual suspects”, such as reward and compensation systems and cybernetic controls, play a minor role compared with other management control practices. While the strong use of cultural controls is in line with previous literature (Epstein and Wisner, 2005; Norris and O'Dwyer, 2004; Riccaboni and Leone, 2010), the second-strongest control type is administrative controls. This result is remarkable, as previous literature suggests that in separate environmental MCSs, administrative controls such as environmental management manuals or internal environmental audits do not primarily drive environmental performance but are necessary for formal control or regulatory requirements.

Furthermore, the results of the moderated mediation model showed that the translation mechanism in an integrated environmental MCS is not equally effective. While the impact of integrating environmental MCSs into regular MCSs increases the relationship between MCSs and environmental managerial performance (i.e., the level of controlling managerial behavior), we do not find a moderation effect on the relationship between environmental strategy and environmental MCSs. This finding could indicate that firms that integrate their environmental MCS into their regular MCS might use this integration primarily for the realization of environmental goals in operative managerial decision making. This finding shows that the essential benefit of integrating environmental MCSs into regular MCSs is the more effective control of managerial (environmental) behavior. Thus, our results bridge both lines of research and show that environmental MCSs as a whole can sufficiently translate environmental strategy into environmental managerial performance and that this translation mechanism is improved

when integrating environmental into regular MCSs. While the latter finding supports the line of research arguing for embedding environmental goals in general corporate management systems (e.g., Gond et al., 2012; Sundin and Brown, 2017), it is important to underline that a nonintegrated environmental MCS also works as a translation mechanism. We believe that the previous either-or perspective should be shifted towards a to-what-degree perspective. The main finding regarding the effective translation mechanism of environmental MCSs is essential for practice because the focus of how companies pursue environmental strategies has shifted from why to how (Epstein and Roy, 2001).

Our study implicates several issues that are important for theory building and research on environmental management control. One issue concerns the role of alignment between a company's strategy and managerial performance (Dent, 1990; Langfield-Smith, 1997; Simons, 1990). Our results indicate that companies prefer cultural and administrative control practices in aligning environmental strategy with environmental managerial performance in contrast to "traditional" control practices, such as cybernetic controls and reward and compensation. This result, however, raises the theoretical questions about how companies balance their MCSs when integrating environmental aspects. We suggest that the use of different management control practices for potentially diverging strategic goals is critical for the efficiency of a company's MCS. In the light of a company's preference for control types such as cultural controls and administrative control, we suppose that companies might use such controls because they can be communicated to external stakeholders in a positive way. Moreover, the low use of reward and compensation controls might reveal internal problems of acceptance or unsolved goal conflicts (Locke and Latham, 1990). We think that an important role for research on environmental MCSs is to examine how key control practices in companies influence managerial behavior when goal

conflicts are present and whether companies solve these goal conflicts upstream in formulating the company's strategy or downstream within the MCS.

Further implications are related to the integration of environmental and regular MCSs. Integration does not influence the entire cause-and-effect chain from strategy to performance with regard to environmental aspects but only influence the impact of the environmental MCS on environmental managerial performance. Specifically, we provide the first evidence that integrated MCSs can promote environmental behavior among managers, thereby promoting integrated thinking, at least with regard to economic and environmental goals. Additionally, the focus of environmental MCSs is on cultural and administrative control practices, whereas regular MCSs rely more on "traditional" control practices, such as cybernetic controls and reward and compensation. Thus, integrating environmental MCSs and regular MCSs can be expected to strengthen the link of "soft" and "hard" approaches to integrated thinking, which according to the findings of Oliver et al. (2016) is essential for fostering integrated thinking. Furthermore, from the manager's perspective, the use of integrated MCSs can be perceived as a kind of signaling by top management, which leads to an adapted behavior and changing goal prioritization among managers. If environmental goals are perceived as relevant to such an extent that the MCS is redesigned to consider them, managers might put more effort into rebalancing their decision making regarding economic and environmental goals. Thus, our finding highlights the important role environmental MCSs can play in the fundamental organizational change required towards integrated thinking as proposed by Gatti et al. (2018). Nevertheless, more research, especially empirical research, is needed to further elaborate these issues. On the one hand, we solely focus on integrating economic and ecological aspects; thus, we do not account

for the entire concept of integrated thinking. On the other hand, the missing impact of integration on the relationship between strategy and MCS also needs to be examined more closely.

A third implication concerns what environmental performance means to a company. While previous research focuses on environmental performance at the firm level, we studied individual environmental managerial performance. Although several frameworks argue for a direct relationship between individual environmental performance and cumulative company environmental performance (e.g., Durden, 2008), we believe it is important to examine the differences between the measurement of environmental performance at the individual and firm levels. We suggest that there might be an essential difference between these two performance measures for two reasons. First, individual environmental managerial performance might have *internal* effects, such as improving environmental sensitivity or awareness. Second, similar to principal agent theory, a company's environmental performance is driven to some extent by environmental factors that are not controllable by the individual manager. Indeed, these two reasons might lead to a difference between the results of studies focusing on individual environmental managerial performance and others focusing on a company's environmental performance. We believe that this difference might shift results when investigating the effects of MCSs or the configuration of management control practices as a translating mechanism.

These findings must be interpreted in light of the limitations of the present study. We used cross-sectional data to analyze the reflection of environmental strategies within MCSs and their influence on environmental managerial performance. Because of the cross-sectional nature of the data, we are not able to investigate feedback loops, such as those from environmental managerial performance to environmental strategy development, as higher environmental managerial performance due to a newly developed environmental strategy may allow

organizations to focus even more on environmental issues and thus further enhance their environmental strategy. Future field research could use longitudinal data to more closely investigate feedback loops between environmental managerial performance and environmental strategy. Moreover, our study focuses on environmental managerial performance and does not analyze other aspects of managerial performance, such as economic performance. Because managers are evaluated with respect to not only environmental objectives but also economic objectives, we believe that the joint analysis of the influence of environmental MCSs on both performance types at the managerial level is fruitful. Thus, further research might consider the interdependencies between environmental and economic managerial performance. Furthermore, the cause-effect relationship between environmental strategy and the integration of environmental MCSs and regular MCSs remains unclear. While we assume a structure-follows-strategy approach, i.e., MCSs are designed to align a previous determined strategy to managerial action, companies might adjust their strategies based on existing MCSs and their possible courses of action. The latter approach suggests that MCSs play an important role in forming strategies, which is not in line with contingency theory. Further research could address this limitation by using a different theoretical foundation.

Companies with proactive environmental strategies could potentially enforce the integration of environmental and regular MCSs. By contrast, this integration might also be found in companies with reactive environmental strategies, albeit for different reasons (e.g., the realization of synergy effects, such as cost reductions). Future research should address this important issue and focus on the drivers of the integration of environmental MCSs and regular MCSs in companies with proactive and reactive strategies.

References

Banerjee, S.B., Iyer, E.S. and Kashyap, R.K. (2003), "Corporate environmentalism: Antecedents and influence of industry type", Journal of Marketing, Vol. 67 No. 2, pp. 106-122.

Bonacchi, M. and Rinaldi, L. (2007), "DartBoards and Clovers as new tools in sustainability planning and control", Business Strategy and the Environment, Vol. 16 No. 7, pp. 461-473.

Buhr, N. and Gray, R. (2012), "Environmental Management, Measurement, and Accounting: Information for Decision and Control?", in Bansal, P. and Hoffman, A. J. (Eds.), The Oxford Handbook of Business and the Natural Environment Oxford University Press, Oxford, pp. 425-443.

Burns, T. and Stalker, G. (1961), The management of innovation, Tavistock, London.

Chalos, P. and Poon, M.C. (2000), "Participation and performance in capital budgeting teams", Behavioral Research in Accounting, Vol. 12, pp. 199-229.

Chapman, C.S. and Kihn, L.-A. (2009), "Information system integration, enabling control and performance", Accounting, Organizations and Society, Vol. 34 No. 2, pp. 151-169.

Chenhall, R.H. (2003), "Management control systems design within its organizational context: findings from contingency-based research and directions for the future", Accounting, Organizations and Society, Vol. 28 No. 2, pp. 127-168.

Church, A.T. and Burke, P.J. (1994), "Exploratory and confirmatory tests of the Big Five and Tellegen's three- and four-dimensional models", Journal of Personality and Social Psychology, Vol. 66 No. 1, pp. 93-114.

Dent, J.F. (1990), "Strategy, organization, and control: Some possibilities for accounting research. ", Accounting, Organizations and Society, Vol. 15, pp. 3-25.

Dumay, J.C., La Torre, M., Bernardi, C. and Guthrie, J. (2018), "Integrated reporting and integrated thinking: Practical challenges", Working paper.

Dunk, A.S. (1993), "The effects of job-related tension on managerial performance in participative budgetary settings", Accounting, Organizations and Society, Vol. 18 No. 7, pp. 575-585.

Durden, C. (2008), "Towards a socially responsible management control system", Accounting, Auditing & Accountability Journal, Vol. 21 No. 5, pp. 671-694.

Epstein, M.J. and Roy, M.-J. (2001), "Sustainability in Action: Identifying and Measuring the Key Performance Drivers", Long Range Planning, Vol. 34 No. 5, pp. 585-604.

Epstein, M.J. and Wisner, P.S. (2005), "Managing and Controlling Environmental Performance: Evidence from Mexico", Advances in Management Accounting, Emerald Group Publishing Limited, pp. 115-137.

Esty, D. and Winston, A. (2009), Green to gold: How smart companies use environmental strategy to innovate, create value, and build competitive advantage, John Wiley & Sons, Hoboken, New Jersey.

Flamholtz, E.G., Das, T.K. and Tsui, A.S. (1985), "Toward an integrative framework of organizational control", Accounting, Organizations and Society, Vol. 10 No. 1, pp. 35-50.

Flora, D.B. and Curran, P.J. (2004), "An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data", Psychological Methods, Vol. 9 No. 4, pp. 466-491.

Furnham, A. and Stringfield, P. (1994), "Congruence of self and subordinate ratings of managerial practices as a correlate of supervisor evaluation", Journal of Occupational and Organizational Psychology, Vol. 67 No. 1, pp. 57-67.
Gadenne, D., Mia, L., Sands, J., Winata, L. and Hooi, G. (2012), "The influence of sustainability performance management practices on organisational sustainability performance", Journal of Accounting & Organizational Change, Vol. 8 No. 2, pp. 210-235.
Galbraith, J. (1973), Designing complex organizations, Addison-Wesley, New York.
Gatti, M., Chiucchi, M.S. and Montemari, M. (2018), "Management control systems and integrated reporting: Which relationships? The case of the Azienda Ospedaliero Universitaria Ospedali Riuniti Ancona", International Journal of Business and Management, Vol. 13 No. 9, pp. 169-181.
Gerdin, J. and Greve, J. (2004), "Forms of contingency fit in management accounting research—a critical review", Accounting, Organizations and Society, Vol. 29 No. 3-4, pp. 303-326.
Gond, J.-P., Grubnic, S., Herzig, C. and Moon, J. (2012), "Configuring management control systems: Theorizing the integration of strategy and sustainability", Management Accounting Research, Vol. 23 No. 3, pp. 205-223.
González-Benito, J., Lannelongue, G. and Queiruga, D. (2011), "Stakeholders and environmental management systems: a synergistic influence on environmental imbalance", Journal of Cleaner Production, Vol. 19 No. 14, pp. 1622-1630.
Grabner, I. (2014), "Incentive system design in creativity-dependent firms", The Accounting Review, Vol. 89 No. 5, pp. 1729-1750.
Green, S.G. and Welsh, M.A. (1988), "Cybernetics and Dependence: Reframing the Control Concept", The Academy of Management Review, Vol. 13 No. 2, pp. 287-301.
Guenther, E., Endrikat, J. and Guenther, T.W. (2016), "Environmental management control systems: a conceptualization and a review of the empirical evidence", Journal of Cleaner Production, Vol. 136, pp. 147-171.
Gunarathne, N. and Lee, K.-H. (2015), "Environmental Management Accounting (EMA) for environmental management and organizational change: An eco-control approach", Journal of Accounting & Organizational Change, Vol. 11 No. 3, pp. 362-383.
Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2009), Multivariate Data Analysis, 7th ed., Prentice Hall, Upper Saddle River, NJ.
Hall, M. (2008), "The effect of comprehensive performance measurement systems on role clarity, psychological empowerment and managerial performance", Accounting, Organizations and Society, Vol. 33 No. 2, pp. 141-163.
Hayes, A.F. (2013), Introduction to mediation, moderation, and conditional process analysis: A regression-based approach, 1st ed., Guilford Publications, New York.
Hayes, A.F. (2015), "An Index and Test of Linear Moderated Mediation", Multivariate Behavioral Research, Vol. 50 No. 1, pp. 1-22.
Henri, J.-F. and Journeault, M. (2010), "Eco-control: The influence of management control systems on environmental and economic performance", Accounting, Organizations and Society, Vol. 35 No. 1, pp. 63-80.
Henri, J.-F., Journeault, M. and Brousseau, C. (2017), "Eco-control change and environmental performance: a longitudinal perspective", Journal of Accounting & Organizational Change, Vol. 13 No. 2, pp. 188-215.
Hopwood, A.G. (1974), Accounting and Human Behaviour, Haymarket, London.

International Integrated Reporting Council (IIRC). (2013), "The International Integrated Reporting Framework", London.
Jaccard, J. and Wan, C.K. (1996), LISREL approaches to interaction effects in multiple regression, Sage, Thousand Oaks, CA.
Jöreskog, K.G. and Sörbom, D. (1986), LISREL VI: Analysis of linear structural relationships by maximum likelihood, instrumental variables, and least squares methods, Scientific Software, Chicago, IL.
Judge, W.Q. and Douglas, T.J. (1998), "Performance Implications of Incorporating Natural Environmental Issues into the Strategic Planning Process: An Empirical Assessment", Journal of Management Studies, Vol. 35 No. 2, pp. 241-262.
Klassen, R.D. (2001), "Plant -level environment management views and plant characteristics", Production and Operations Management, Vol. 10 No. 3, pp. 257-275.
Langfield-Smith, K. (1997), "Management control systems and strategy: a critical review", Accounting, Organizations and Society, Vol. 22 No. 2, pp. 207-232.
Langfield-Smith, K. (2006), "Understanding management control systems and strategy", in Bhimani, A. (Ed.), Contemporary Issues in Management Accounting, Oxford University Press, pp. 243-265.
Lawrence, P.R. and Lorsch, J. (1967), Organization and environment: Managing differentiation and integration, Irwin, Homewood, IL.
Lee, K. (2012), "Carbon accounting for supply chain management in the automobile industry", Journal of Cleaner Production, Vol. 36, pp. 83-93.
Libby, R. and Tan, H.-T. (1994), "Modeling the determinants of audit expertise", Accounting, Organizations and Society, Vol. 19 No. 8, pp. 701-716.
Liu, Y., Guo, J. and Chi, N. (2015), "The Antecedents and Performance Consequences of Proactive Environmental Strategy: A Meta-analytic Review of National Contingency", Management and Organization Review, Vol. 11 No. 3, pp. 521-557.
Locke, E.A. and Latham, G.P. (1990), A theory of goal setting & task performance, Prentice-Hall, Inc, Englewood Cliffs, NJ.
Mahoney, T.A., Jerdee, T.H. and Carroll, S.J. (1965), "The Job(s) of Management", Industrial Relations: A Journal of Economy and Society, Vol. 4 No. 2, pp. 97-110.
Malhotra, R., Chan, A., Malhotra, C. and Østbye, T. (2012), "Validity and reliability of the Caregiver Reaction Assessment scale among primary informal caregivers for older persons in Singapore", Aging & Mental Health, Vol. 16 No. 8, pp. 1004-1015.
Malmi, T. and Brown, D.A. (2008), "Management control systems as a package—Opportunities, challenges and research directions", Management Accounting Research, Vol. 19 No. 4, pp. 287-300.
Marginson, D. and Ogden, S. (2005), "Coping with ambiguity through the budget: the positive effects of budgetary targets on managers' budgeting behaviours", Accounting, Organizations and Society, Vol. 30 No. 5, pp. 435-456.
Norris, G. and O'Dwyer, B. (2004), "Motivating socially responsive decision making: the operation of management controls in a socially responsive organisation", The British Accounting Review, Vol. 36 No. 2, pp. 173-196.
Oliver, J., Vesty, G. and Brooks, A. (2016), "Conceptualising integrated thinking in practice", Managerial Auditing Journal, Vol. 31 No. 2, pp. 228-248.

Otley, D. (2016), "The contingency theory of management accounting and control: 1980–2014", Management Accounting Research, Vol. 31, pp. 45-62.
Parker, R.J. and Kyj, L. (2006), "Vertical information sharing in the budgeting process", Accounting, Organizations and Society, Vol. 31 No. 1, pp. 27-45.
Pedersen, E.R. and Neergaard, P. (2008), "From periphery to center: how CSR is integrated in mainstream performance management frameworks", Measuring Business Excellence, Vol. 12 No. 1, pp. 4-12.
Perego, P. and Hartmann, F. (2009), "Aligning Performance Measurement Systems With Strategy: The Case of Environmental Strategy", Abacus, Vol. 45 No. 4, pp. 397-428.
Perrow, C. (1967), "A framework for the comparative analysis of organizations", American Sociological Review, pp. 194-208.
Podsakoff, P.M., MacKenzie, S.B. and Podsakoff, N.P. (2012), "Sources of Method Bias in Social Science Research and Recommendations on How to Control It", Annual Review of Psychology, Vol. 63 No. 1, pp. 539-569.
Pondeville, S., Swaen, V. and De Rongé, Y. (2013), "Environmental management control systems: The role of contextual and strategic factors", Management Accounting Research, Vol. 24 No. 4, pp. 317-332.
Preacher, K.J., Rucker, D.D. and Hayes, A.F. (2007), "Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions", Multivariate Behavioral Research, Vol. 42 No. 1, pp. 185-227.
Rae, K., Sands, J. and Gadenne, D.L. (2015), "Associations between organisations' motivated workforce and environmental performance", Journal of Accounting & Organizational Change, Vol. 11 No. 3, pp. 384-405.
Riccaboni, A. and Leone, E.L. (2010), "Implementing strategies through management control systems: the case of sustainability", International Journal of Productivity and Performance Management, Vol. 59 No. 2, pp. 130-144.
Rodrigue, M., Magnan, M. and Boulianne, E. (2013), "Stakeholders' influence on environmental strategy and performance indicators: A managerial perspective", Management Accounting Research, Vol. 24 No. 4, pp. 301-316.
Russo, M.V. and Harrison, N.S. (2005), "Organizational Design and Environmental Performance: Clues from the Electronics Industry", The Academy of Management Journal, Vol. 48 No. 4, pp. 582-593.
Schaltegger, S. and Burritt, R. (2000), Contemporary Environmental Accounting: Issues, Concepts and Practice, 1st ed., Greenleaf Publishing, Sheffield.
Sharma, S. (1997), "A longitudinal Investigation of environmental responsiveness Strategies: Antecedents and Outcomes", Academy of Management Proceedings, Vol. 1997 No. 1, pp. 460-464.
Sharma, S. (2000), "Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy", Academy of Management Journal, Vol. 43 No. 4, pp. 681-697.
Sharma, S. (2009), "The mediating effect of information availability between organization design variables and environmental practices in the Canadian hotel industry", Business Strategy and the Environment, Vol. 18 No. 4, pp. 266-276.
Simons, R. (1987), "Accounting control systems and business strategy: an empirical analysis", Accounting, Organizations and Society, Vol. 12 No. 4, pp. 357-374.

Simons, R. (1990), "The role of management control systems in creating competitive advantage: New perspectives", Accounting, Organizations and Society Vol. 15, pp. 127-143.
Snow, C.C. and Hambrick, D.C. (1980), "Measuring Organizational Strategies: Some Theoretical and Methodological Problems", Academy of Management Review, Vol. 5 No. 4, pp. 527-538.
Spector, P.E. (2006), "Method Variance in Organizational Research: Truth or Urban Legend?", Organizational Research Methods, Vol. 9 No. 2, pp. 221-232.
Sundin, H. and Brown, D.A. (2017), "Greening the black box: integrating the environment and management control systems", Accounting, Auditing & Accountability Journal, Vol. 30 No. 3, pp. 620-642.
Thompson, J.D. (1967), Organizations in action, McGraw Hill, New York.
Trinkle, B.S. and Lam, M. (2014), "Construct Validity Of Organizational Appeal: A Newly Identified Influence Tactic to Elicit Professional Accountants' Task Commitment", in Bobek Schmitt, D. (Ed.), Advances in Accounting Behavioral Research, Emerald Group Publishing Limited, pp. 183-211.
Van der Stede, W.A., Young, S.M. and Chen, C.X. (2005), "Assessing the quality of evidence in empirical management accounting research: The case of survey studies", Accounting, Organizations and Society, Vol. 30 No. 7-8, pp. 655-684.
Venkatraman, N. and Ramanujam, V. (1987), "Measurement of Business Economic Performance: An Examination of Method Convergence", Journal of Management, Vol. 13 No. 1, pp. 109-122.
Warner, R.M. (2012), Applied Statistics: From Bivariate Through Multivariate Techniques, 2nd ed., Sage, Thousand Oaks.
Wentzel, K. (2002), "The Influence of Fairness Perceptions and Goal Commitment on Managers' Performance in a Budget Setting", Behavioral Research in Accounting, Vol. 14 No. 1, pp. 247-271.
Wisner, P.S., Epstein, M.J. and Bagozzi, R.P. (2009), "Environmental proactivity and performance", in Freedman, M. and Jaggi, B. (Eds.), Sustainability, Environmental Performance and Disclosures, Emerald Group Publishing Limited, pp. 105-127.
Zhao, X., Lynch, J.J.G. and Chen, Q. (2010), "Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis", Journal of Consumer Research, Vol. 37 No. 2, pp. 197-206.

Endnotes:

1. We restricted the maximum number of items to three for the measurement of an environmental strategy and each management control practice to avoid an excessively long questionnaire. The only exception is the measurement of environmental managerial performance by Mahoney et al. (1965), which required all items to be asked because of the different dimensions of managerial action.
2. Specifically, we used a principal axis factoring (PAF) analysis because with PAF, the analysis of the data structure focuses on shared variance and not on sources of error that are unique to individual measurements. In contrast to a principal component analysis (PCA), PAF analyzes the shared variance instead of the entire variance (Warner, 2012).